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Big or Small: does the size of a secondary school matter?

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ABSTRACT The relationship between the size of a school and various education outcomes continues to interest parents, campaigners and politicians. This article summarises some of the arguments made in relation to the importance of school size and explores the results of a systematic review of 31 research studies on the effects of secondary school size. Overall, the review found that directions and patterns of effect vary for different outcomes. The results of the review suggested that there was little empirical evidence to justify policies aimed at changing or mandating particular school sizes. However, given the continuing interest in the issue and indications that more research is becoming available, the author suggests that continuing rigorous systematic evaluation is needed to explore the association between school size and outcomes.

Introduction

An article in the *Sunday Times* in January 2008 reported that the optimal size of secondary schools was about 800 children. The overall thrust of the article was that secondary schools in England are becoming too big. The article included the *Sunday Times* own data and the opinion of a 'professor of education' to support the newspaper's claim (Sian Griffiths, *Sunday Times*, 6 January, 2008). Issues raised in the article reflect a long-standing public and media interest in the issue of school size. One of the attractions of 'size' is that, in theory at least, the issue is amenable to relatively simple controls. Decisions about the size of any new school are made in consultation with local authorities, and size is often cited as a justification for closing a particular school. In England, government policy on school admissions has been gradually moving towards a model whereby individual schools have more freedom to choose the size of their intake. This could be viewed as a reduction in the country's collective capacity to control school size or, more benignly, as transferring the power over the decision from politicians (local or national), to parents and schools themselves.

Whatever view is taken, it is useful to know whether, and under what circumstances, school size is in fact an important determinant of outcomes.

Arguments in Favour of and against Bigger or Smaller Schools

Many different arguments have been offered as to why school size might affect student achievement. Broadly speaking, it is argued that larger schools are able to offer wider curricular and extra-curricular opportunities and a concomitant increase in teacher specialisation. Against this it is argued that smaller schools are able to offer a more personalised learning environment (Darling Hammond et al, 2002) and that this facilitates greater interaction and participation by students and teachers alike.

Another related group of arguments concerns the ways in which *changes* in school size brought about through planning or through the operation of quasi-market forces may affect the quality of educational provision. For example, it is argued that 'poorly performing' schools will be unpopular and therefore decline in size as parents choose to send their children to 'successful' schools. This, it is argued, will lead the shrinking school to 'improve its performance'. This type of argument is linked to issues about the value of the wider functions of schools as centres of community networks and the consequences for local communities of school closure. This is where the school size debate intersects with general issues about the public provision of school places, especially in rural areas, and is a prominent feature of school size research in the USA.

The notion of 'economies of scale' provides the basic framework around which arguments about costs of education in relation to school size are constructed. Scale economies occur when the cost of enrolling an additional student is lower than the average cost at that point, thereby resulting in the average cost declining as enrolments increase. If it can be shown that the same or better educational outcome can be achieved at a lower cost per pupil in larger schools, there may be a case for setting a mandatory minimum school size, or for limiting the size of schools if average costs are found to rise once a certain level of enrolment is exceeded (McKenzie, 1995).

What Size are Secondary Schools?

For the 3,343 publicly-funded secondary schools in England (excluding schools admitting only students with special needs) in January 2007, more than 50 per cent had between 700 and 1,200 pupils. About 2 per cent of schools had more than 1,800 pupils and about 1 per cent had fewer than 300 pupils (DCSF, 2007). Whilst the top end of the range in England may appear considerably lower than its equivalent in the USA (which has schools of 5,000+ pupils), like the USA there is a wide range in the size of secondary schools.

Knowing how many schools there are, and of what size, does not, however, tell us very much. We need to know whether there is any relationship

between the size of a school and any outcomes that we may think indicate something about the quality of educational provision in that school. We might do this by referring to theoretical arguments about the relationship between size and outcomes, as in the examples above. But given that different, and sometimes opposing, arguments are made we would also want to explore the relationship empirically i.e. through research.

Research on School Size

The relationship between school size and outcomes could be empirically investigated in a number of different ways. Quantitative approaches investigate the relationship between school size as an 'independent variable' and a range of 'dependent' outcome variables. Data are generally cross-sectional, derived from national school census returns and/or large scale school surveys. In some instances data may be longitudinal, considering the effects as a school changes size either through school consolidation or normal variations in enrolment. Based on relevant theories (and on pragmatic considerations such as availability of data), researchers control for particular variables in their models (either by matching or by inclusion as an independent variable), and select an appropriate method of statistical analysis.

Qualitative approaches may, through case studies of particular schools or local authorities, provide a very detailed description of the relationships between school size and other factors. These approaches may be particularly helpful in identifying contextual factors affecting school size, the preoccupations of key people (such as head teachers, teachers and pupils) in schools of different sizes and, through observational studies, qualitative differences between schools of different size.

Systematic Review

Before conducting any new primary research to answer a question it is useful to consider the evidence provided by existing studies. There are numerous 'reviews' of research on school size (for example, Cotton, 1996; McGuire, 1989; Muir, 2000; Spielhofer et al, 2002; Tasker, 2003). These reviews all have limitations of one kind or another. One thing they have in common is that they do not provide a clear explanation of how the author identified, selected, or synthesised the evidence they use; that is they were not reported in a way that made it possible to assess their relative strengths and weaknesses as reviews. Not surprisingly, the reviews come to different conclusions, but it is not clear to the reader why they did so.

In 2003 the EPPI-Centre was commissioned by the (then) Department for Education and Skills (DfES) to conduct a systematic review of the relationship between school size (expressed as the number of students) and 'outcomes'.[1] A systematic review differs from the traditional literature review in that it is

undertaken as a piece of research and thus uses a transparent and explicit process or method. Specifically:

- it answers a research question;
- it is protocol driven;
- an explicit search strategy is used to identify all possible research evidence;
- an explicit set of criteria are used to select studies for inclusion in the review;
- a coding tool is used to obtain the same information about all the studies included in the review;
- this information is used to make a judgement about the quality and relevance of a particular study to the review question;
- the results of the individual studies are synthesised in a systematic and transparent manner to generate a 'new' and/or summary answer to the review question.[2]

The remainder of this article provides a summary of the findings of this review.

Results of the Systematic Review

The systematic review addressed the following question: 'In OECD countries since 1990 what is the relationship between secondary schools of different sizes and various 'outcome' variables?'.[3] A total of 3,874 citations were identified through systematic searches of six databases. After screening all of these, 31 studies were included in the review. The majority of studies in the review were carried out in North America, with 21 from the USA and two from Canada. The remaining studies came from England (six), Finland (one) and Australia (one).

The studies were grouped according to outcome measure used: student attainment (19 studies), student drop-out and absence (five studies), student violence (six studies), student and teacher perceptions of school climate (five studies), economic outcomes (five studies), and school organisational practices (two studies). Within each of these categories studies were sub-divided according to their quality**.** The type of analysis used in the studies produced a 'slope' showing the direction of 'effect' as either increasing as school size increases (positive, +), decreasing as school size increases (negative, -), increasing and then decreasing as school size increases (quadratic, ∩), or some combination of these. Figure 1 shows a summary of the slope or direction of effect for each of these outcome groups. The summary direction of effect reflects the review group's judgment about what the evidence found in the studies included in the review tells us about the relationship between secondary school size and that particular outcome.

Overall, the results suggest a quadratic association between school size and student attainment in exams. That is, attainment increases as school size increases up to a certain point but then appears to decline. The findings from a number of studies suggest that, within the secondary range, the association between attainment and size may be different across age groups and for students with different levels of socio-economic status (SES).

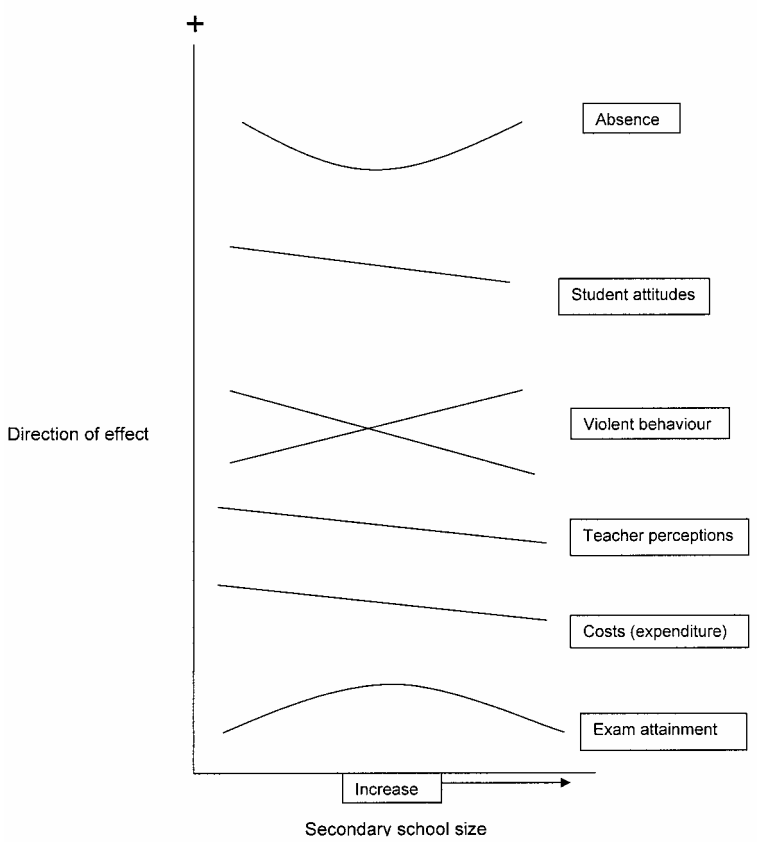

Figure 1. Summary of directions of main effect for different outcome categories. Note: this figure is for illustrative purposes only and is not based on literal interpretations of quantitative coefficients reported.

Overall the results suggest a quadratic association between school size and student absence. That is, absence decreases as school size increases up to a certain point but then appears to increase. None of the studies examined variation on this outcome (or any of the subsequent outcomes reported below) by age or SES.

The summary of directions of effect for school size and student behaviour in Figure 1 illustrates the inconsistency of results in the included studies. In some studies there was increased ' violence' in larger schools; for other studies the association was in the opposite direction, i.e. there was more 'violence' in smaller schools. Different studies use different definitions of violent or anti-social behaviour and different methods of data collection, either of which may explain the different directions of effect reported.

Studies measuring what students and teachers thought about their school found a negative association between school size and this outcome, despite different conceptualisations, outcome measures and instruments used. Such a pattern of results suggests that we can be fairly confident that teachers and students in smaller schools have more positive perceptions of the school climate than their counterparts in larger schools.

In all studies measuring the association between school size and costs, the 'costs' measured were limited to public expenditure on schools. The pattern of results here suggests that as school size increases the school's cost per pupil decreases. The size of the association between average secondary school size and costs differs slightly between studies. An increase in school size of 10 per cent is estimated to reduce costs per student by between one per cent and four per cent depending on the definition of cost used.

Discussion

When considering the implications of the results provided by the systematic review it is important to take into account its limitations. The remit of this review extended only to a consideration of studies that investigated empirically the association between an outcome variable and school size. It is also important to note that studies from the USA about the division of larger schools into much smaller schools (so called 'schools-within-schools') were excluded from the review because they did not meet the criteria for inclusion.

The review process itself had a number of limitations. Comparatively limited searches were undertaken and we were not able to obtain all of the papers identified. It is difficult to estimate the impact of this. A simple preliminary analysis of the sensitivity of the bibliographic database search found that between 60 and 70 per cent of papers cited in the included studies had been identified. The design of studies included in the in-depth review allowed for sophisticated analysis of the degree of association between the dependent variable (for example, attainment) and school size. However, the studies did not assign students or teachers at random to different size schools (i.e. they did not use an experimental design), and therefore may be affected by selection bias. Conclusions about causality must therefore be considered tentative.

Different studies use different analytical models, different methods of analysis and different methods of constructing both the dependent and independent variables. Making comparisons across studies is therefore difficult, even when they use the same dependent variable. There are also differences in the socio-economic and cultural contexts of schooling in different countries. Taken together, these differences may limit the generalisability of conclusions about the 'effects' of school size on school outcomes.

Another important limitation of the findings is that the individual studies in the review only measure a limited range of outcomes. Attainment, for example, is measured only in terms of performance in tests and examinations, which is only one aspect of attainment. Similarly, the costs of schooling are

measured only in terms of the financial costs to government. School size impacts on a much wider range of costs and benefits than those included in existing studies.

Conclusions

The systematic review was concerned with the overall relationship between secondary school size and outcomes. In terms of the overall relationship, i.e. across all outcomes, the association with school size would appear to be inconsistent. In practical terms this suggests that for some types of outcomes larger schools do better than smaller schools and for others smaller schools do better.

Three key issues require further consideration. First, to be of practical value we would need to know at what school size attainment is likely to be maximised and absence (or student drop-out) is minimised. Being confident that the relationship is quadratic does not tell us very much. For example, a quadratic relationship with an optimal size range of about 400 students may have quite different implications to one where the optimal range is about 2,000 students. As we have seen earlier, an optimum size range of 2,000 would include just about all secondary schools in England and so would not be particularly useful. The studies included in this review do not provide a clear answer to this question. Second, we need to know whether the directions of 'effect' based on the 'average' secondary school apply to all types of secondary school and/or subgroups of particular students. Third, we need to know the 'effect' on outcomes of *changing* the size of *individual* schools. Such an analysis would need to include not only the effects on the school that had changed size but also effects on neighbouring schools. Only two studies in the systematic review attempted this. Bradley & Taylor (1998, 2004) provide empirical evidence that schools which perform well (according to GCSE point scores) relative to neighbouring schools grow more quickly in size than schools that perform badly. What these studies do not tell us, however, is how changes in school size within localities affected the overall performance of students in those localities, nor was it clear in these studies whether higher GCSE performance led to increased enrolment or higher enrolment led to increased GCSE performance.

The findings of the systematic review would seem to refute some of the more prevalent myths regarding the advantages and disadvantages of smaller and larger schools. For example, the view that student attainment is universally higher in smaller schools and that student behaviour is universally worse in larger schools is inconsistent with the evidence in the systematic review. These relationships appear to be much more complex than such simple arguments suggest.

The EPPI-Centre review on secondary school size does not provide strong evidence to support policy initiatives that aim to either increase or decrease the size of schools and/or to close or change the structure of schools below or

above a certain size. The review findings suggest that for some outcomes, there may be advantages for smaller schools whilst for other outcomes larger schools may be more advantageous. There are also a number of qualifications that need to be taken into account when considering the practical application of these results. Firstly, the 'effects' of changing school size within a single school and the upheaval associated with this are not identified or investigated in this review. Secondly, many of the associations (even if they are statistically significant) are comparatively weak, and other factors are shown to be as important or more important in predicting the outcome variable. In particular, whilst many studies found a statistically significant association between school size and attainment, this was found to be considerably weaker than the association between SES and attainment across all the studies in the review.

The issue of school size continues to excite interest amongst policy makers, campaigners, researchers and parents. This is not surprising given continuous changes in demographic profiles, continuing concern over inequalities in educational attainment and continued emphasis on economic efficiency. Further work is need in this area, both quantitative and qualitative. Since the systematic review was published, economists at OECD have analysed data from the PISA study and suggested that larger schools are more 'efficient' (Sutherland & Price, 2007). Economists at the Centre for the Economics of Education have analysed a new combination of large-scale, individual-level administrative datasets linked by the Department for Children, Schools and Families and the Department for Innovation, Universities and Skills including data from the National Pupil Database and Pupil Level Annual School Census. They argue the results of their analysis suggest that larger schools are more effective at getting their pupils to University (Chowdry et al, 2008).

However 'efficiency' at obtaining exam grades, or getting to university, are not the only things we might take note of when considering how big or small we want our secondary schools to be. We might also be interested in wider aspects of children's education and want to know about non-governmental 'costs' such as costs to families and communities of changes in school size. Consolidation of any kind may lead to more travel for students and/or loss of school buildings for community use for example. It is therefore important that any claims made about the association between school size and outcomes continue to be critically and systematically investigated using a range of different perspectives.

Notes

[1] The Department for Education and Skills (DfES) and HM Treasury (the UK government department responsible for much economic and financial policy) in England funded the review, set the initial scope, and were involved in refining the research questions in collaboration with the research team.

[2] Interested readers can find out more about how to conduct systematic reviews on the methods pages of the EPPI-Centre website

(http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=89). Further details of the methods used in the systematic review on school size can be found in the detailed reports and papers published on the review (Garrett et al, 2004; Newman et al, 2005).

[3] OECD Countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

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